

Claims

1. An elevator safety chain for monitoring the condition of a plurality of safety-related parameters of an elevator, said parameters including at least one of: hoistway door lock, car door lock, upper limits, lower limits, emergency stop switch,
5 inspection switch, and overspeed sensor; characterized by:
at least one transceiver (23, 26, 27) for transmitting interrogation signals and for receiving responses to said interrogation signals; and
at least one passive radio frequency identification device
(22, 33, 35, 36) (RFID) associated with a corresponding one of said parameters, the
10 frequency determining circuitry (40, 41, 43, 44, 47, 48) of any said RFID being related to said corresponding parameter to have the capability to provide a transmitted response to an interrogation signal from one said transceiver indicative of a safe condition, when the condition of the corresponding parameter is safe, and not providing said indication of a safe condition when the condition of the corresponding parameter is not safe.
- 15 2. A safety chain according to claim 1 wherein:
said RFID includes a switch (44, 48) that is opened and closed in response to the condition of the corresponding parameter, said switch associated with frequency-determining circuitry (40, 41) of said RFID so as to cause the frequency determination to
20 result in a transmitted response indicative of a safe condition when said switch is in a position indicative of the fact that the condition of the corresponding parameter is safe.
3. A safety chain according to claim 2 wherein said switch (43, 48) is connected in series with frequency-determining elements (40, 41, 47) of said frequency
25 determining circuitry.
4. A safety chain according to claim 2 wherein said switch (44) is connected in parallel with frequency-determining elements (40, 41) of said frequency determining circuitry.

5. A safety chain according to claim 2 further comprising:
an additional frequency-determining element (47); and wherein
said switch (48) connects said additional frequency-determining element to said
frequency-determining circuitry.

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6. An elevator safety chain according to claim 1 wherein:
said frequency-determining circuitry (40, 41) is responsive to structure having
magnetic reluctance adjacent to said RFID; and further comprising:

a structure (51, 71) having magnetic reluctance, the position of which is
10 indicative of the condition of said corresponding parameter, the safe or unsafe condition
of said parameter being determined by the presence or absence of said structure
immediately adjacent to said RFID in a manner which will alter the frequency of said
frequency-determining circuit.

15 7. A safety chain according to claim 6 wherein the presence of said
structure (71) adjacent to said RFID (17) indicates a safe condition.

8. A safety chain according to claim 6 wherein the presence of said
structure (71) having magnetic reluctance adjacent to said RFID (18) indicates an unsafe
20 condition.

9. An elevator call system for monitoring at least one of a car call button
and a hall call button, characterized by:
at least one transceiver (23, 26, 27) for transmitting interrogation signals and for
25 receiving responses to said interrogation signals; and
at least one passive radio frequency identification device (RFID) (14, 19, 34)
associated with a corresponding one of said call buttons, the frequency determining
circuitry (40, 41, 43, 44, 47, 48) of any said RFID being related to said corresponding call
button to have the capability to provide a transmitted response to an interrogation signal

from one said transceiver indicative of the button being actuated, when the corresponding button is actuated and not providing said indication of the button being actuated when the corresponding button is not actuated.

5 10. A safety chain according to claim 9 wherein:
 said RFID includes a switch (44, 48) that is operated by the corresponding
 button, said switch associated with frequency-determining circuitry (40, 41, 47) of said
 RFID so as to cause the frequency determination to result in a transmitted response
 indicative of a call request when said switch is in a position indicative of the fact that the
10 corresponding button is actuated.

 11. A safety chain according to claim 10 wherein said switch (43, 48) is
 connected in series with frequency-determining elements (40, 41, 47) of said frequency
 determining circuitry.

15 12. A safety chain according to claim 10 wherein said switch (44) is
 connected in parallel with frequency-determining elements (40, 41) of said frequency
 determining circuitry.

20 13. A safety chain according to claim 10 further comprising:
 an additional frequency-determining element (47); and wherein
 said switch (48) connects said additional frequency-determining element to said
 frequency-determining circuitry (40, 41).

25 14. An elevator safety chain according to claim 9 wherein:
 said frequency-determining circuitry is responsive to structure having magnetic
 reluctance adjacent to said RFID; and further comprising:
 a structure having magnetic reluctance, the position of which is determined by
 said corresponding button, the actuated or unactuated condition of said button being

indicated by the presence or absence of said structure immediately adjacent to said RFID in a manner which will alter the frequency of said frequency-determining circuit.

15 15. A safety chain according to claim 6 wherein the presence of said structure adjacent to said RFID indicates a call request.

16. An elevator system including a safety chain for monitoring the condition of a plurality of safety-related parameters of an elevator, said parameters including at least one of: hoistway door lock, car door lock, upper limits, lower limits, emergency stop switch, inspection switch, and overspeed sensor; said elevator system also for monitoring at least one of a car call button and a hall call button, characterized by:

 at least one transceiver (23, 26, 27) for transmitting interrogation signals and for receiving responses to said interrogation signals;

15 at least one passive radio frequency identification device (safety RFID) (22, 33, 35, 36) associated with a corresponding one of said parameters, the frequency determining circuitry (40, 41, 43, 44, 47, 48) of any said safety RFID being related to said corresponding parameter to have the capability to provide a transmitted response to an interrogation signal from one said transceiver indicative of a safe condition, when the condition of the corresponding parameter is safe, and not providing said indication of a safe condition when the condition of the corresponding parameter is not safe; and

20 at least one passive radio frequency identification device (call RFID) (14, 19, 34) associated with a corresponding one of said call buttons, the frequency determining circuitry of any said call RFID being related to said corresponding call button to have the capability to provide a transmitted response to an interrogation signal from one said transceiver indicative of the button being actuated, when the corresponding button is actuated, and not providing said indication of the button being actuated when the corresponding button is not actuated.